Iron Crossings and Brass Rims

– and a Thwarted Passing Strike

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Figure 1. Small single-handed iron clock with a painted dial and a painted iron case. Note the long crutch.

Whereas English 30-hour posted frame clocks are mostly constructed with brass frames and brass wheels, on the Continent of Europe the frames are usually of iron with the wheels also made of iron on early clocks, but after the first few decades of the 18th century brass wheels were widely used. Brass clocks became more predominant towards the west in countries such as France, Belgium and The Netherlands, but even here all-iron clocks are known,[1] as well as a few English lantern clocks with iron frames.[2]

In mainland Europe, a common type of country-made clock was similar to that shown, **Figure 1**, with a painted dial (which had been used for at least three centuries before they were 'invented' in Birmingham in 1772), enclosed in a painted iron case and hanging on the wall. Like most of these clocks, it is not signed and its country of origin is not easy to determine. This will be discussed later. It has some features that are typical of these clocks, as well as several that are not usual and one that is very rarely found.

While these wall clocks can have dials up to 12″ wide,[3] they are usually much smaller, typically about 7 or 8″, but this one is particularly small, the one-piece dial being only 4″ (102mm) wide by 6″ (150mm) tall, the chapter ring extending a further ½″ (15mm) at each side. The areas above and below the chapter ring are pained a dark bluish-green colour framed by a red line, with the iron side doors similarly decorated. The Roman hour numerals sit between two red circles, with the centre being a plain off-white colour. There was never an alarm. Two tabs at the bottom of the dial sit in slots in the movement bottom plate, while two tabs at the top are held in slots in the top cover, **Figure 2**. On this cover is fixed a two-armed bell-strap and the pendulum backcock, which is riveted to it. The long crutch extends about 3″(75mm) below the bottom plate.

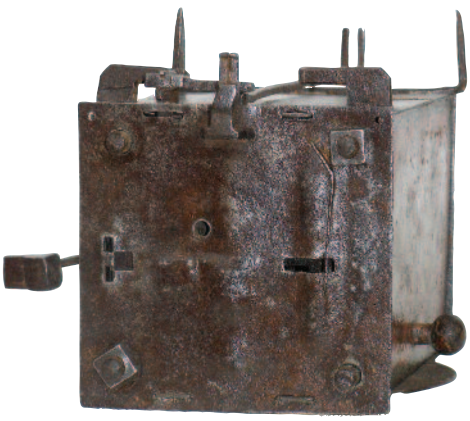

Figure 2. Top cover with bell removed.

Figure 3. Rear of the case showing the separate cocks for the pendulum and rear pallet arbor pivot, the supports for the hanging hoop and spikes.

The rear cover, **Figure 3**, is held in a similar manner to the dial and has a bar with spikes to hold it off the wall. Instead of the usual hoop (which is typically much smaller than on an English lantern clock) there are two L-shaped pieces around which a hanging hoop can be hooked. An advantage is that the clock can be made to sit vertically on a wall that is out of plumb, but it has not been seen on other clocks. The side doors, **Figure 4**, have iron pull knobs, but no turnbuckles or catches and are a simple push-fit behind the dial. Due to the large wheels (see later) the left-hand door has a slot for the hammer and a shaped cover.

The movement, **Figures 5–10**, has the usual Germanic[4] type of iron posted frame with top and bottom plates connected by square-section iron corner posts having screwed extensions at both ends. Whereas English posted-frame clocks usually have the strikework arbors

Figure 4. Left-hand door with a slot for the hammer and a shaped cover for the large going second wheel.

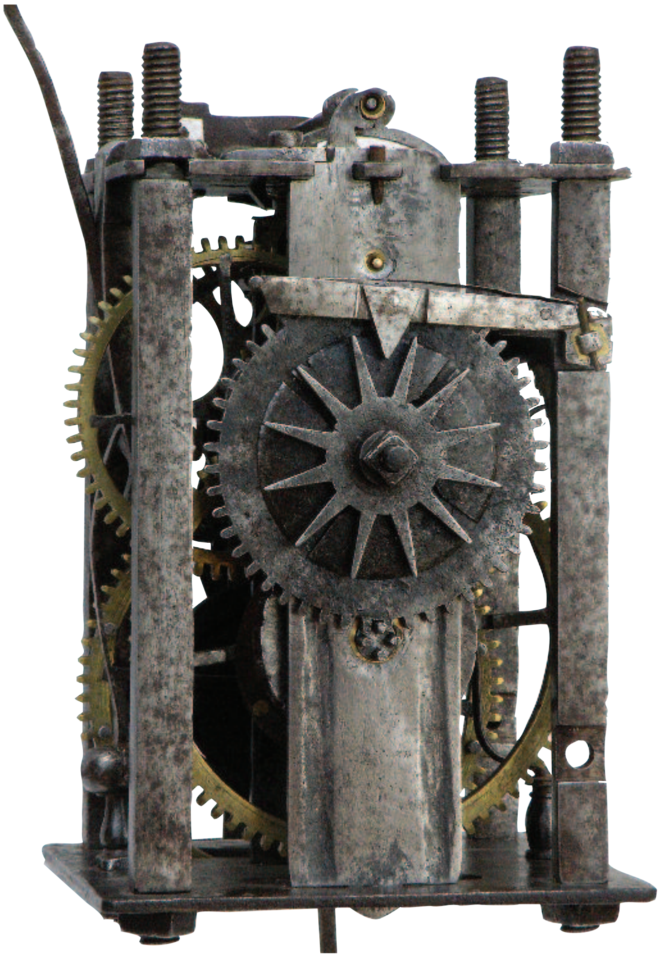

Figure 5 The front of the iron posted-frame movement with an iron hour wheel, starwheel and nag's head.

pivoted between cruciform extensions of the movement bars, on French clocks they pivot between the corner posts with screw-in pivots at one end[5] and on German clocks both ends pivot in the posts. So that the pivots can be located without the frame having to be completely disassembled the holes in the top plate for two diagonally opposite posts are replaced by slots. By loosening the appropriate nuts these posts can be swung out far enough to allow the arbors to be inserted, **Figure 8**.

The iron movement bars, **Figure 11**, have either one or two tabs at their lower ends that sit in slots, in a similar manner to the pins on English posted-frame clocks, with the central bar held with a wedge. Slots at the top of the front and rear bars sit over tenons filed into the edges of the plate. This is the Germanic method and is normally also used at the lower end of the bars, especially on clocks from southern Germany.

The wheels of the going and striking trains are shown in **Figure 12** and **13**. Winding of both trains is by the usual Germanic type of vee-pulley with serrated sides that grip a hard rope. Provided there are counterweights, this system is quite reliable and in not so prone to filling the movement with fluff from a soft rope and spikes. There are separate weights and counterweights for each train, not a Huygens loop, which is primarily found on English and Dutch clocks and on only some French posted-frame clocks.

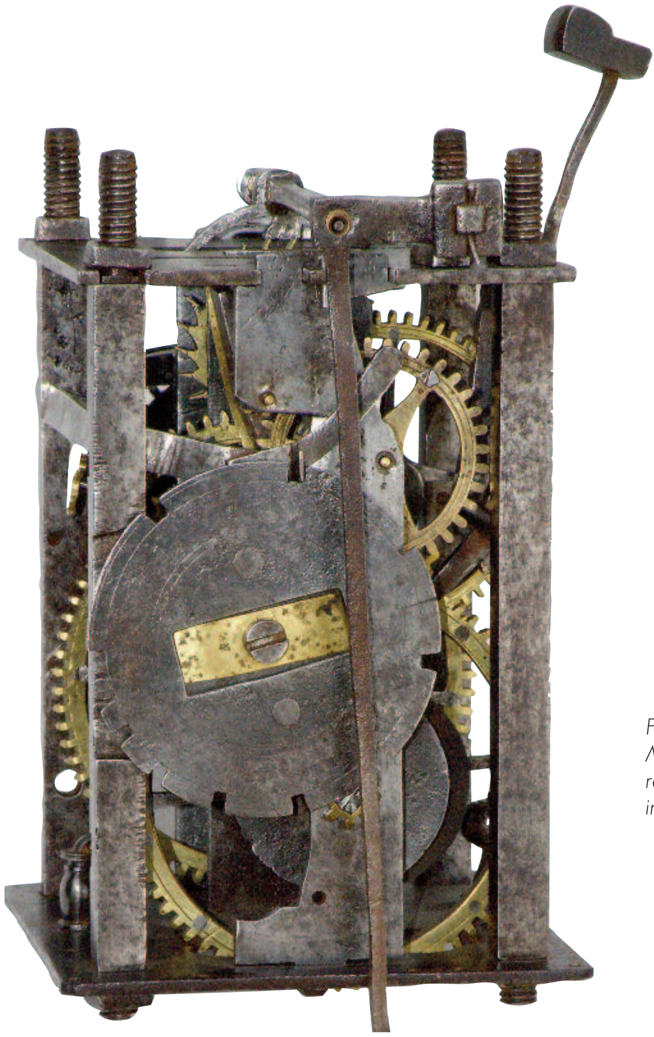

Figure 6. Movement from the rear showing the iron countwheel.

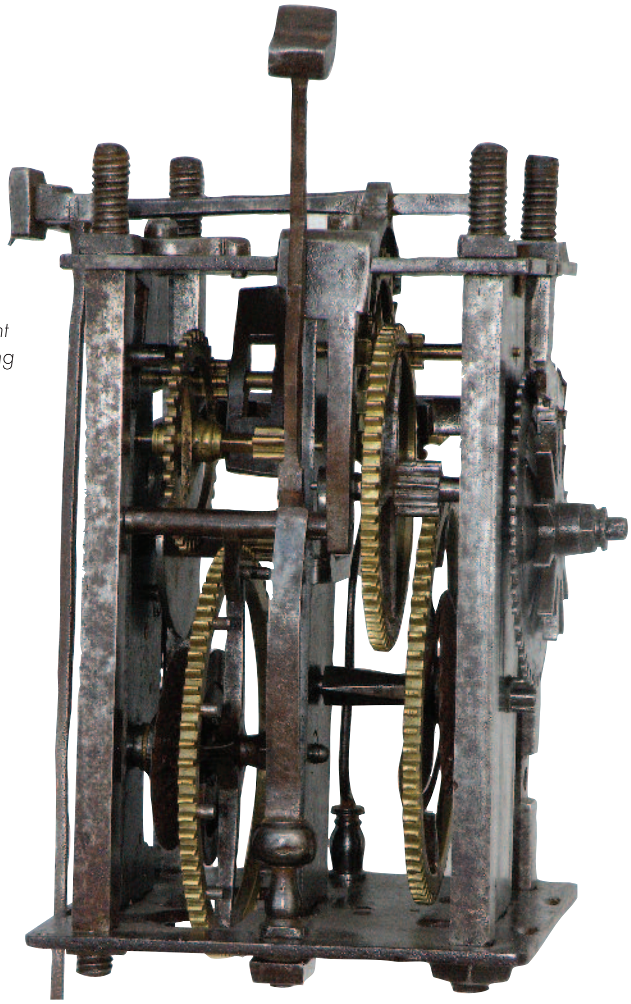

Figure 7. Movement from the left showing the hammer and hammer spring.

Each greatwheel has a circular spring winding click acting on the crossings, rather than the ratchet teeth cut into one side of the pulley as normally found on south German clocks. The crossings of both wheels have been very worn by the click, particularly on the going train but this is probably due to the strength of that spring rather than the clock having been run for long periods without winding the striking train. Some of the arbors

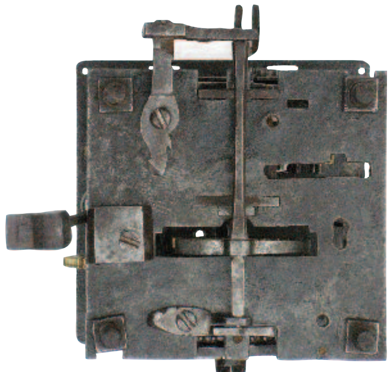

Figure 9. Top view showing the anchor escapement. The block to the right of the hammer is the top of a bracket holding the front pivot of the hammer arbor.

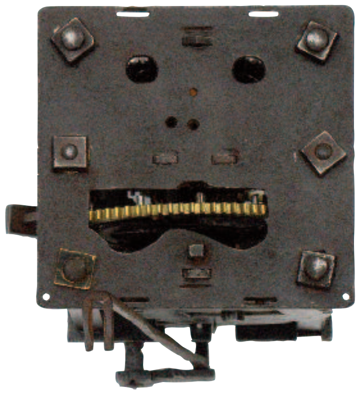

Figure 10. The bottom plate with an aperture to accommodate the large striking greatwheel.

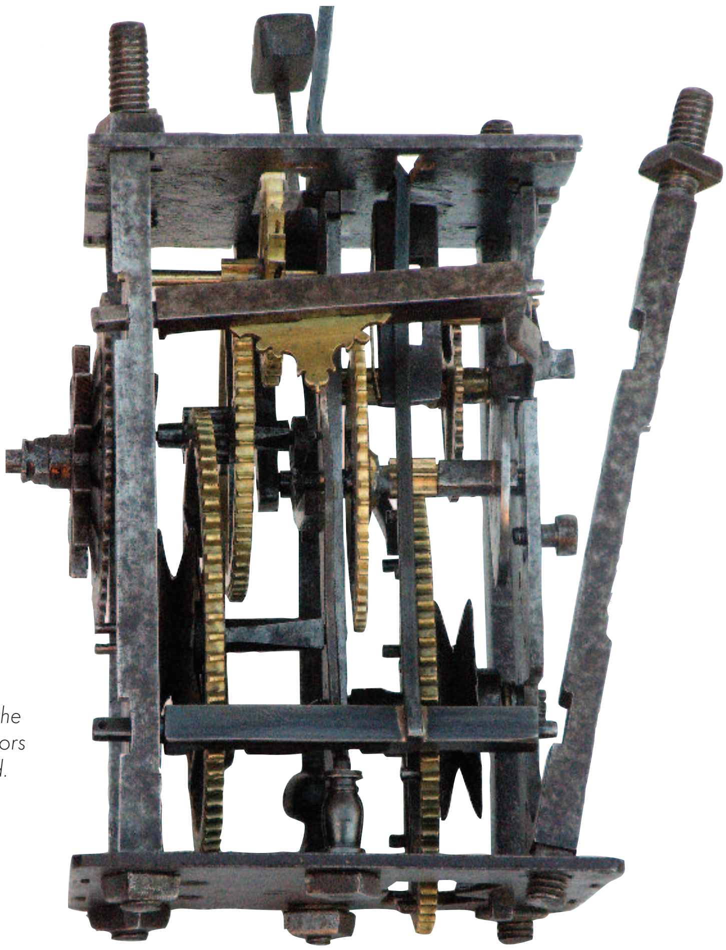

Figure 8. View from the right showing how the strikework arbors are assembled.

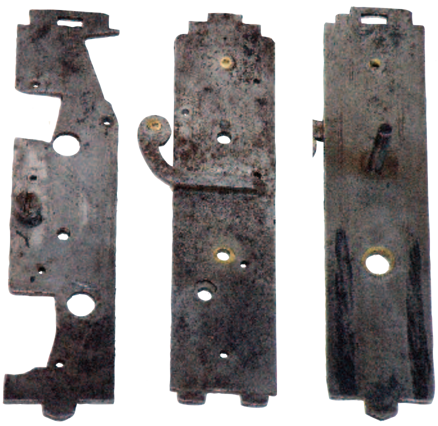

Figure 11. The iron movement bars. The second wheel of the going train pivots in an extension riveted to the front and centre bars.

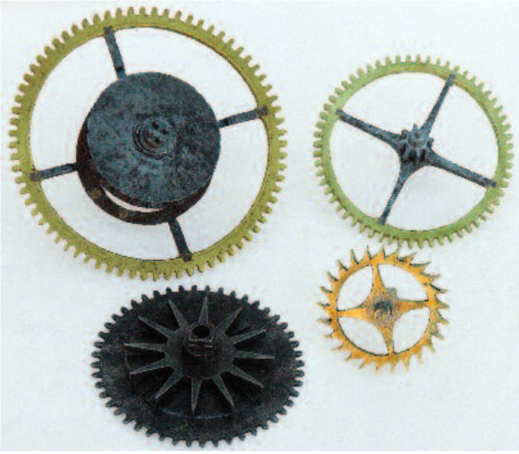

Figure 12. The going train with composite iron and brass greatwheel and second wheel.

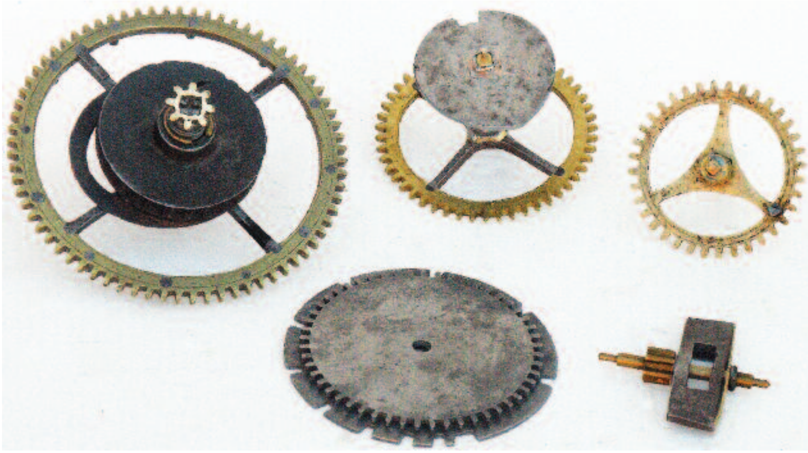

Figure 13. The striking train with composite iron and brass greatwheel and second wheel.

and pinions have been incorrectly replaced in brass.

The iron starwheel ('ratch') and hour wheel are driven by a four-pronged pinion-of-report filed into the arbor of the going greatwheel. The counts of the going train are:

Escapewheel	25 — 6
2nd wheel	60 — 8
Greatwheel	72 — 4
Hour wheel	48

The calculated beat is 0.8 seconds with a theoretical pendulum length of 25″ (64mm). The great wheel rotates once per hour giving a duration of about 14 hours depending on the weight drop. The pallet arbor of the anchor escapement pivots between a short front cock and a rear cock, **Figure 9**, the latter only supporting the rear pivot, not the pendulum, which hangs on a separate backcock riveted to the top cover. The rear cock is made in two parts, one held on the top plate by a screw (as is the front cock), with the actual pivot support squared on to it and held with a taper pin. This seems unnecessarily complex without any obvious advantage.

The counts of the striking train are:

Fly	6
Locking wheel	36 — 5
2nd wheel	50 — 6
Greatwheel	72 — 8
(12 hammer pins)	
Countwheel	52

The most remarkable feature of this clock is the construction of the first two wheels of each train. Up to the early decades of the 18th century, iron clocks were literally that: made solely of iron including the wheels, with pivots running directly in the iron movement bars. Later iron clocks have cast brass wheels with some, but often not all, of the arbors pivoting in brass plugs. Iron wheels were forged from two bars: one was slit at each end with a chisel and opened out to form the spokes or crossings; the other was forged into a flat ring and the ends fire welded to give an often undetectable join. The rims were then forged on to the crossings. They are a tribute to the great skill required to make wheels that are both concentric and without wobble.

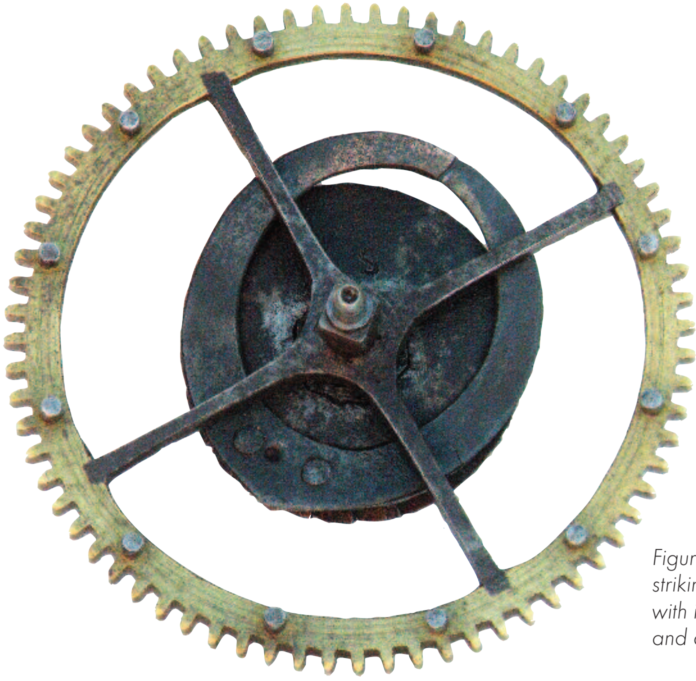

Figure 14. The striking greatwheel with iron crossings and a brass rim.

However, the four largest wheels of this clock are composed of iron crossings with brass rims. Exactly how this was done is not known, but since the ends of some of the crossings are at an angle (for instance the top-right one in **Figure 14**) the rim may have been cast on to the crossings, rather than the ends hammered into slots. No matter what method was used, this seems an unnecessarily complicated procedure. Apart from some very early (about 1530) French 'double-decker' table clocks, which have brass teeth brazed on to the iron crownwheel, and a report of composite wheels on a primitive longcase movement 'probably Münsterland or further eastwards',[6] these have not been seen before. Was it simply a clockmaker improvising due to a shortage of brass?

Another noticeable feature of the composite wheels is their large size – both greatwheels being approximately 3¾″ (95mm) diameter and filling the full width of the movement. To fit such large wheels into a small frame, the striking greatwheel protrudes through a long slot in the bottom plate that also accommodates the winding rope, **Figure 10**. The second wheel of the going train also has to sit partly outside the edge of the frame, and since the front movement bar is not wide enough it is pivoted in outriggers riveted to the front and central bars,

Figure 11. Consequently, to allow the left-hand door to shut there is a clearance aperture covered by a shaped cover, **Figure 4**. In addition, the front of the horizontal hammer arbor would block the going second wheel, so it is of reduced length, **Figure 15**, and its front end pivots in an iron bracket hanging down from the top plate, **Figures 7** and **9**.

The countwheel striking is let off by a nag's head[7] and a twelve-pointed starwheel, **Figure 5**. This 'warnless' system was widely used in Germany, although the arrangement seen here is not entirely conventional. While normally the overlift (here provided by a single 'heart' cam on the second wheel), countwheel and locking detents are part of a multi-purpose arm, on this clock locking is on a separate arm contacting a stop pin on the far side of the third wheel. Instead of just one cut-out in the rear movement bar to accommodate the countwheel detent this one has another on the right-hand side, **Figure 11**. A third cut-out at the lower left with a couple of small holes are at present unexplained, as are a large hole towards the top and a screw hole in the centre. The latter also fits the pivot post of the countwheel, which may have been its original, but incorrect, position.

Figure 15. The hammer and spring (left) and the strikework arbor and its return spring.

Figure 16. The new parts of the abandoned passing strike.

Keen-eyed readers may have noticed a hole in the front right-hand corner post, **Figure 2**, with a corresponding pivot hole in the rear post and a long slot in the top plate, **Figure 9**, which were for a missing passing half-hour strike. Thinking that restoring such a simple mechanism would be an easy task, new parts were made, **Figure 16**, but poor planning by the original clockmaker had left a booby-trap for the unwary. It soon became clear that the new arbor needed cutting away to clear the going greatwheel, which corresponded exactly with that on the existing strikework arbor. Clearly this had originally been intended for the passing strike but re-used when the half-hour strike was abandoned. A lifting piece was made to fit on a square on the front extension of the new arbor, as well as a vertical hammer shaft with a removable head to match that for the hour strike, and with a spring, also to match that on the hour strike.

The obvious position for the hammer shaft was directly below the slot in the top plate, but the corresponding slot in the cover was, for some inexplicable reason, offset towards the front – a horizontal spring on the top cover to keep the hammer from jangling on the bell confirms the arrangement. The new hammer arbor and shaft at this stage can be seen in **Figure 8**. After much adjusting so that the dog-leg shaft would pass through both slots without catching on the sides, the passing strike worked tolerably well when on the bench. Then the booby-trap was sprung – during the hour strike the new hammer shaft prevented the fly from rotating. Despite much bending, tweaking and fiddling (technically known as 'adjusting') there was simply not enough room between the extremity of the fly's rotation and the strikework arbor. I had to swallow my pride and abandon the restoration of the passing strike, much the wiser. Why the movement maker did not put the clearance slots towards the front and line them up so that they were not offset is a complete mystery. The move of the strikework arbor from the lower to its present upper position indicates that a passing strike had been planned from an early stage and it is not a later modification, but the unexplained cut-out in the rear movement bar does not appear to be part of it. The new parts could have been made to work by simply cutting extra slots in the top plate and cover (the side door precludes the hammer curving round outside the frame), but in the spirit of good conservation ('do not improve') this was not done. It shows that early clockmakers were as just as fallible as their present-day counterparts.

It now remains to decide the clock's origins, this being determined primarily by constructional rather than stylistic features. It was probably made about the middle of the 18th century or possibly earlier, almost certainly in Germany, which is now a large country, but at that time comprised independent states unified by a common language as part of the Holy Roman Empire of the German Nation. While the frame and vee-pulleys are typical of southern Germany the escapement is not, and for this type of clock a crownwheel-and-verge with a cowtail pendulum swinging in front of the dial are more usual. The lower fixing of the movement bars and the circular spring click are more typical of clocks from further west. Also, on clocks from southern Germany the hammer arbor very often, but by no means exclusively, swings about a vertical axis so it can sit inside the case, rather than with a horizontal arbor as here. The best guess (and what is said about most iron clocks, especially early ones, is mostly guesswork) is that it comes from the Rhineland or further to the west or north.

This interesting little clock exhibits many features that are quite different from those found on its English counterpart, but with the very unusual feature of composite wheels made of iron and brass. The author would be very interested to learn about other examples.

REFERENCES

1 Normandy clocks, for instance, usually have iron posted frames and brass wheels. See Robey, John, *Horological Journal*, August 2014, pp314-19 'A French 8-Day Lantern Clock'.
2 Robey, John A., *Antiquarian Horology*, March 2011, pp689-704, 'English Lantern Clocks With Iron Frames'.
3 Robey, John A., Antiquarian Horology, June 2013, pp240-3, 'Picture Gallery: 30-hour iron wall clock dated 1748'.
4 This term includes clocks made in the Austrian Tirol and northern Switzerland.
5 Robey, John A., HJ, August 2014, pp314-19, 'A French 8-Day Lantern Clock'.
6 Information from Ian D. Fowler.
7 Robey, John A., HJ, November 2011, pp494-7, 'Nag's Head Striking'.